

(239)**A New EMAT Design for Generating Torsional Guided Wave Modes for Pipe Inspections**

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Guided waves inspection is a well-established method for the long-range ultrasonic inspection of pipes. Guided waves, used in a pulse-echo arrangement, can inspect a large range of the pipe from a single point as the pipe structure carries the waves over a large distance due to the relatively low attenuation of the wave modes. However, the complexity of the dispersion characteristics of these pipe guided wave modes are well known, and can lead to difficulty interpreting the obtained results. The torsional family of guided wave modes are generally considered to have much simpler dispersion characteristics; especially the fundamental $T(0,1)$ mode, which is nominally non-dispersive, making it particularly useful for guided wave inspection. Torsional waves have been generated by a circumferential ring of transducers to approximate an axi-symmetric load to excite this $T(0, 1)$ mode. Presented here is a new design of EMAT that can generate a $T(0, 1)$ as a single transducer, rather than a circumferential array of transducers that all need to be excited in order to generate an axisymmetric force. The EMAT consists of a periodic permanent magnet array and a single meander coil, meaning that the excitation of the torsional mode is greatly simplified. The design parameters of this new EMAT are explored, and the ability to detect notch defects on a pipe is demonstrated.

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